SYSTEM

Technical Information

PCU-UPTEMPO

Mezzanine I/O Expansion Board
Multifunction Side Card for the PC6-TANGO Low Power CPU

Edition 2.2

Document No. 8747 • 17 April 2019

Contents

About this Manual

This manual is a short form description of the technical aspects of the PCU-UPTEMPO, required for installation and system integration. It is intended for the advanced user only. The latest version of this document may be obtained from www.ekf.com/p/pcu/pcu_ti.pdf.

Edition History

Ed.	Contents/*Changes*	Author	Date
1	Technical Information PCU-UPTEMPO, english, preliminary edition Text #8747, File: pcu_ti.wpd	jj	14 February 2018
2	Added photos PC6-TANGO PCU-UPTEMPO assembly	jj	17 July 2018
2.1	Typo fixed Realtek Audio	jj	11 February 2019
2.2	Added photos SUE-SUJ RS-232 & RS-485 isolated transceiver modules	jj	17 April 2019

Related Documents

Related Information PCU-UPTEMPO	
PCU-UPTEMPO Home	www.ekf.com/p/pcu/pcu.html
PCU-UPTEMPO Technical Information (this document)	www.ekf.com/p/pcu/pcu_ti.pdf

Related Documents CompactPCI® PlusIO & CompactPCI® Serial	
CompactPCI® PlusIO Home	www.ekf.com/p/plus.html
CompactPCI® Serial Home	www.ekf.com/s/serial.html

Nomenclature

Signal names used herein with an attached '#' designate active low lines.

Trade Marks

Some terms used herein are property of their respective owners, e.g.

- Core™, Atom™: ® Intel
- CompactPCI, CompactPCI PlusIO, CompactPCI Serial: ® PICMG
- Windows: ® Microsoft
- EKF, ekf system: ® EKF

EKF does not claim this list to be complete.

Legal Disclaimer - Liability Exclusion

This manual has been edited as carefully as possible. We apologize for any potential mistake. Information provided herein is designated exclusively to the proficient user (system integrator, engineer). EKF can accept no responsibility for any damage caused by the use of this manual.

Standards

Reference Documents		
Term	**Document**	**Origin**
CompactPCI®	CompactPCI Specification, PICMG® 2.0 R3.0, Oct. 1, 1999	www.picmg.org
CompactPCI® PlusIO	CompactPCI PlusIO Specification, PICMG® 2.30 R1.0, November 11, 2009	www.picmg.org
CompactPCI® Serial	PICMG® CPCI-S.0	www.picmg.org
HD Audio	High Definition Audio Specification Rev.1.0	www.intel.com/design/chipsets/hdaudio.htm
LPC	Low Pin Count Interface Specification, Revision 1.1	developer.intel.com/design/chipsets/industry/lpc.htm
M.2 Module	PCI Express M.2 Specification Revision 1.0 Formerly known as the Next Generation Form Factor (NGFF) In use here for SATA SSD	www.pcisig.com
PCI Express®	PCI Express® Base Specification 3.0	www.pcisig.com
RS-232	Telecommunications Industry Association TIA 232 Sometimes inaccurately referred to as DOS COM port, based on a hardware interface called UART (universal asynchronous receiver/transmitter)	www.tiaonline.org
SATA	Serial ATA Specifications (3.2 Gold)	www.sata-io.org
USB	USB 2.0 Universal Serial Bus Specification	www.usb.org

Related Information CPU Carrier Cards	
PC6-TANGO	www.ekf.com/p/pc6/pc6.html

Features

Feature Summary

General

- Mixed function mezzanine side card for CompactPCI® PlusIO CPU boards
- Provides additional front panel I/O, on-board M.2 based SATA SSD mass storage, and optional rear I/O capabilities across the J2 backplane connector
- Suitable for use with the EKF PC6-TANGO low power CPU board
- 8HP assembly together with CPU card
- 12HP assembly in total with CPU card and C32-FIO mezzanine

Front Panel I/O

- Dual RS-232 connectors male DSUB-9 (COM port pin assignment, MAX3243 transceivers)
- Option dual USB 2.0 connectors, electronic power switches 1.5A
- Option single USB 2.0 connector and 2 x analog audio F/P jacks 3.5mm in/out
- Option C32-FIO mezzanine for additional front panel I/O (2 x RS-232, PS/2 KB/MS)
- Integrated 8HP front panel for CPU carrier card and PCU-UPTEMPO
- Integrated 12HP front panel when C32-FIO 3rd floor mezzanine is installed in addition

On-Board SATA Mass Storage

- Dual M.2 sockets (formerly known as NGFF), B-coded, SATA 3.0 6G speed, classic AHCI protocol, suitable for installation of any popular operating system
- Lower on-board M.2 socket suitable for an SATA 6G based SSD M.2 module up to 22110 size, wired to the HSE mezzanine connector SATA port 1, derived directly from the PC6-TANGO carrier card Intel® APL-I SoC, Intel® driver support
- Upper on-board M.2 socket suitable for an SATA 6G based SSD M.2 module up to 2280 size, wired to the HSE mezzanine connector SATA port 2, derived from the PC6-TANGO on-board Marvell® 9170 PCIe to SATA controller (may not be populated on all PC6-TANGO SKUs)

Feature Summary

On-Board Functions

- SIO (Super I/O Controller) SCH3114 attached to the LPC interface (4 x UART, PS/2, GPIO)
- HD-Audio Codec ALC262 (option)

Rear I/O Option

- Rear I/O is optional - available on customers request
- Rear I/O connector J2 as defined by the CompactPCI® specification
- Legacy interface rear I/O option KB/MS, up to 4 x UART, GPIO

Environmental, Regulatory

- Designed & manufactured in Germany
- ISO 9001 certified quality management
- Custom specific development available on request
- Long term availability
- Rugged solution
- Coating, sealing, underfilling on request
- RoHS compliant
- Operating temperature 0°C to +70°C (commercial temperature range)
- Operating temperature -40°C to +85°C (industrial temperature range) on request
- Storage temperature -40°C to +85°C, max. gradient 5°C/min
- Humidity 5% ... 95% RH non condensing
- Altitude -300m ... +3000m
- Shock 15g 0.33ms, 6g 6ms
- Vibration 1g 5-2000Hz
- EC Regulations EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1)
- MTBF 75.5 years

General Information

*Available as a mezzanine add-on expansion board (aka side board) to the PC6-TANGO and successor low power CompactPCI® PlusIO CPU carrier cards, the **PCU-UPTEMPO** provides additional I/O functions available via front panel connectors. Some interfaces are also available as an option via rear I/O. The PCU-UPTEMPO can be equipped with two M.2 style SATA 6G SSD modules, up to the 22110 format, for rugged mass storage needs.*

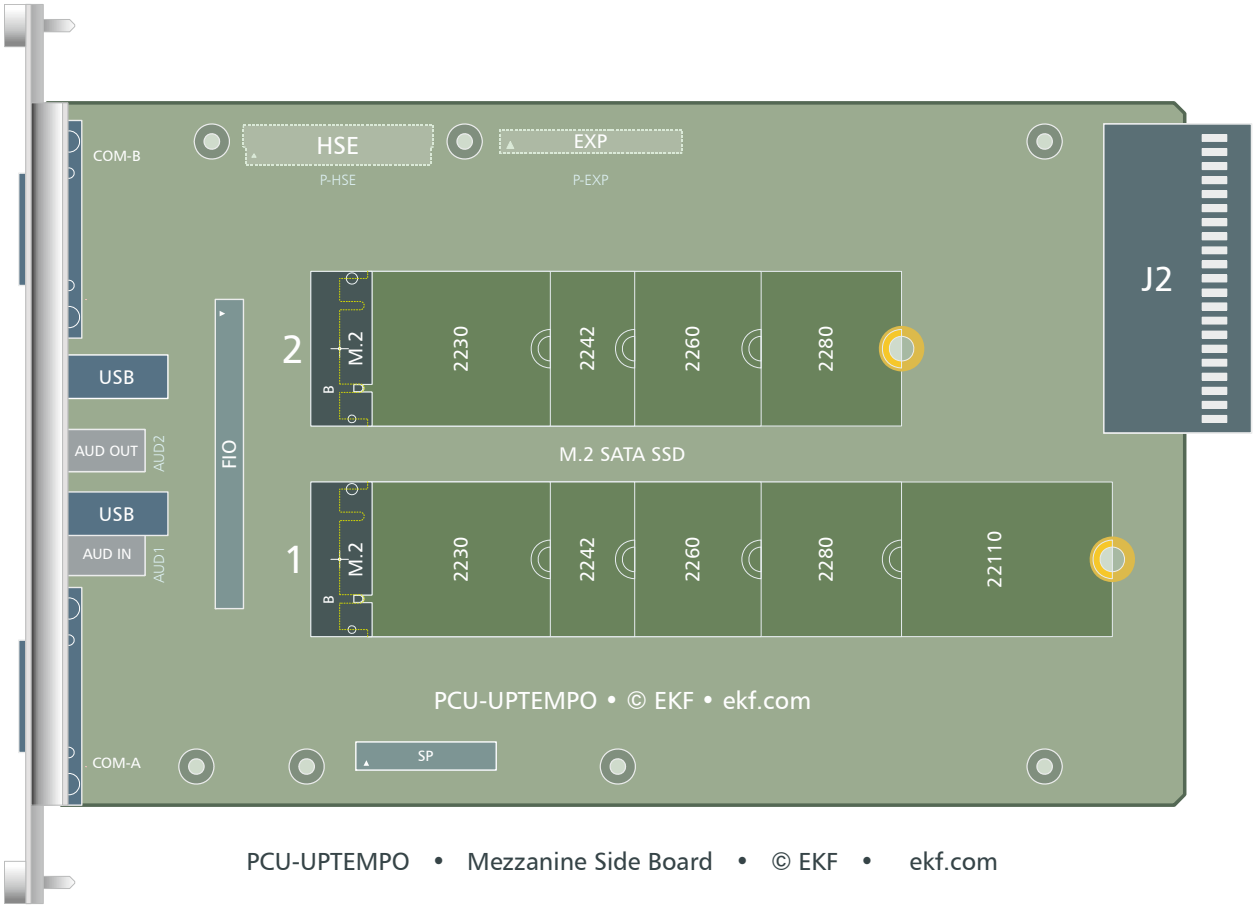
The PCU-UPTEMPO front panel accommodates two RS-232 (COM port) D-Sub connectors, and one ore two USB 2.0 receptacles. As an option, two 3.5mm analog audio jacks (input and output) are available. The CPU carrier board and the PCU-UPTEMPO side card come as an ready to use assembly unit, sharing a common 8HP width front panel. With a 12HP front, another two RS-232 connectors can be provided.

System Requirements

The PCU-UPTEMPO is a mezzanine side card, to be fixed on top of a suitable CPU carrier board e.g. PC6-TANGO. The pitch between carrier PCB and mezzanine PCB is 4HP, resulting in a 8HP common front panel for the entire assembly. Two mezzanine inter-board connectors are in use, for distribution of legacy and high speed I/O signals from the CPU carrier to the side board. These are referred to as *HSE* (PCI Express®, SATA & USB High Speed Expansion), *and EXP* (Legacy Expansion). The mezzanine connectors are situated on the bottom side of the PCU-UPTEMPO, facing towards their mating CPU card connectors.

The PCU-UPTEMPO also is a carrier board itself, which can accommodate two M.2 SATA SSD modules, and a front panel I/O expansion card (C32-FIO) as an option.

It is recommended to have the CPU card system slot on the right edge of the backplane, in order to prevent loss of a peripheral slot (the PCU-UPTEMPO is then positioned out of the backplane shape). For systems with a hybrid backplane which provides both CompactPCI® Classic and CompactPCI® Serial slots with the CPU board in the middle, J2 (UART and GPIO rear I/O) is populated as an option only.



PCU-UPTEMPO • Mezzanine Side Board • © EKF • ekf.com

Storage Options

The PCU-UPTEMPO can accommodate either one or two M.2 (NGFF) style SSD modules based on the SATA interface (AHCI).

The preferred M.2 socket is marked 1 (the lower situated connector) and can be populated with a module up to the 22110 size. The associated 6G SATA port 1 is derived from the CPU carrier card via the mezzanine connector HSE.

With respect to the PC6-TANGO CPU board, this SATA channel is directly controlled by the SoC (Intel® APL-I). Suitable AHCI drivers should be part of any popular operation system, and can be downloaded as an alternate from the Intel® website.

The M.2 socket 2 (upper connector) can be used with an SATA SSD module up to the 2280 size.

On the PC6-TANGO CPU carrier card this SATA port (PCU-UPTEMPO M.2 socket 2) is driven by a dedicated PCIe to 6G SATA host controller (Marvell® 88SE9170). Since this component may be optional, usage of the M.2 socket 2 requires a PC6-TANGO version populated with the 9170 SATA controller. Either standard AHCI drivers or Marvell® WHQL drivers are available.

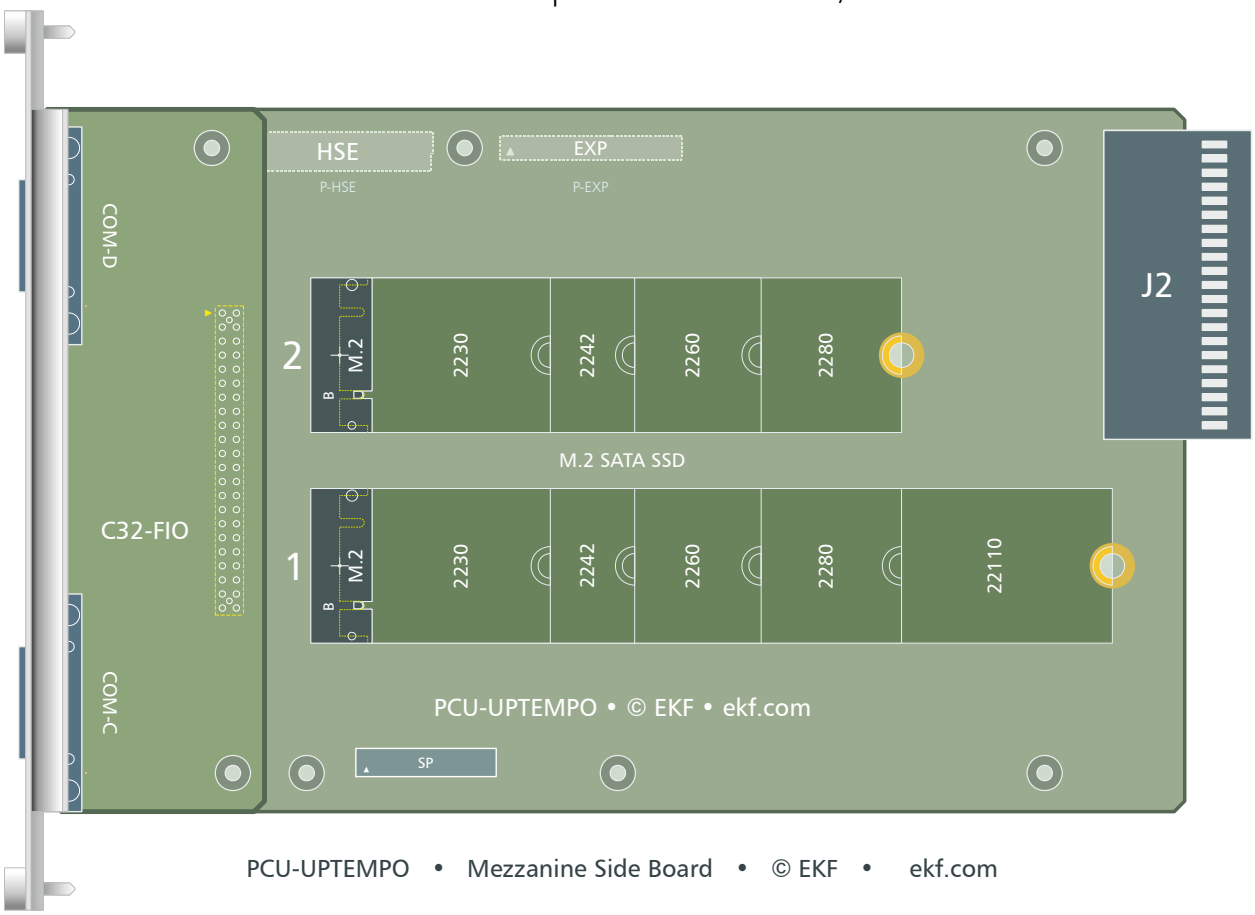
M.2 SSD modules are available up to 2TB as of current, for 4TB mass storage capacity in total with the PCU-UPTEMPO.

Front Panel I/O

The PCU-UPTEMPO expands the suite of front panel connectors of a particular CPU carrier board by an USB 2.0 receptacle, 3.5mm Audio In/Out jacks, and two D-Sub connectors with EIA-232 COM port pin assignment. As an option, two USB 2.0 connectors would be available when no audio is required.

In addition, the PCU-UPTEMPO can accommodate the C32-FIO front panel I/O mezzanine module, for a total front panel width of 12HP.
The C32-FIO provides another two RS-232 COM ports, and *(optionally only)* a PS/2 style keyboard/mouse Mini-DIN connector.

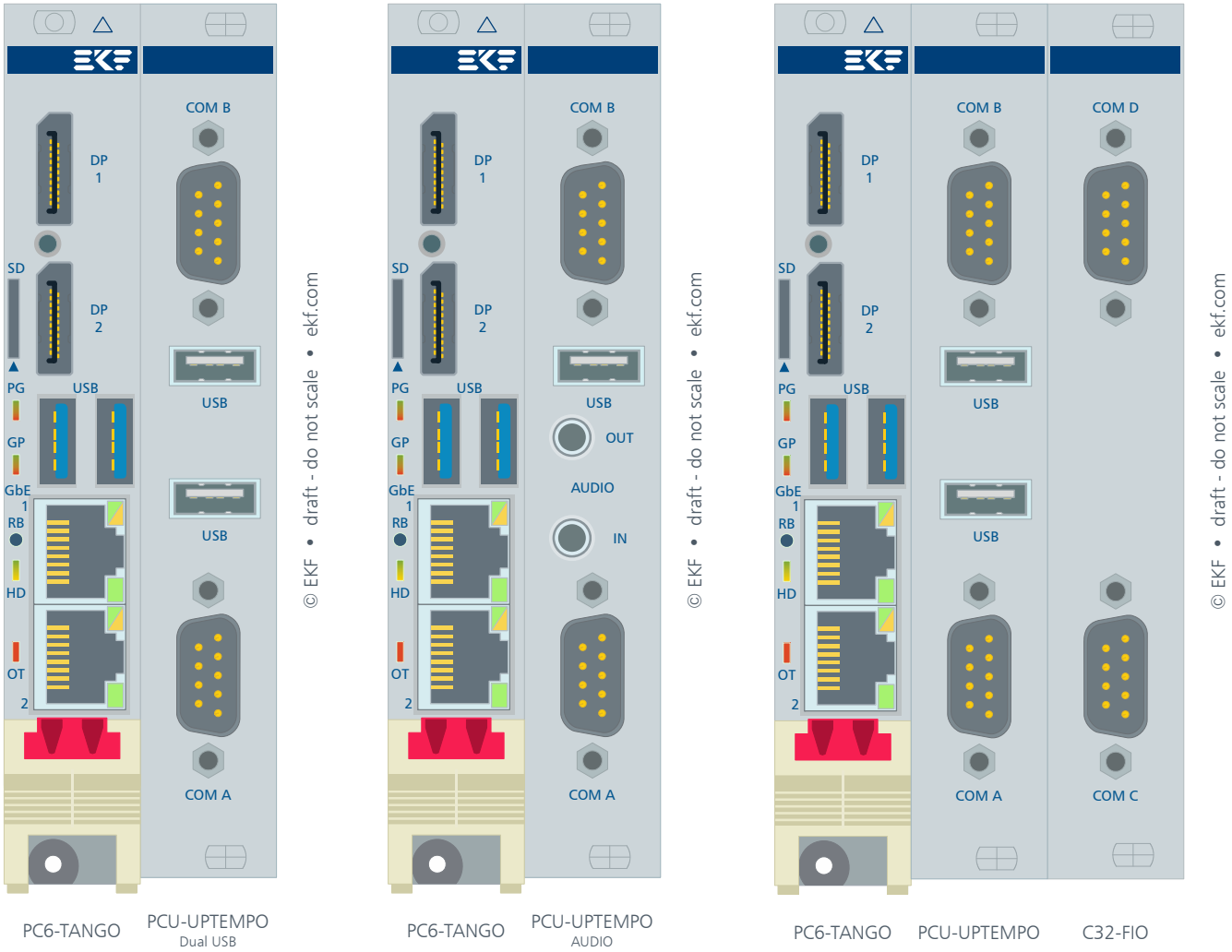
PCU-UPTEMPO • Option C32-FIO Front I/O Module



PCU-UPTEMPO • Mezzanine Side Board • © EKF • ekf.com

Related Documents	
C32-FIO Mezzanine Front I/O Module	www.ekf.com/c/ccpu/c32/c32_tie.pdf

Sample Front Panel Options 8HP/12HP



Rear I/O

Some legacy I/O would be available trough the optional J2 rear I/O connector, such as UART and KB/MS.

Rear I/O usage requires a suitable single slot backplane which mates the PCU-UPTEMPO, and in addition a custom specific rear I/O module.

Theory of Operation

The PCU-UPTEMPO side board communicates by means of two bottom mount expansion connectors with the host CPU: HSE (High Speed Expansion meaning SATA 6G), and EXP (multi-function legacy I/F such as LPC). Best results can be achieved with the PC6-TANGO CPU carrier card. Other CPU cards which provide the HSE and EXP connectors may also be compatible with the PCU-UPTEMPO, but are not discussed here.

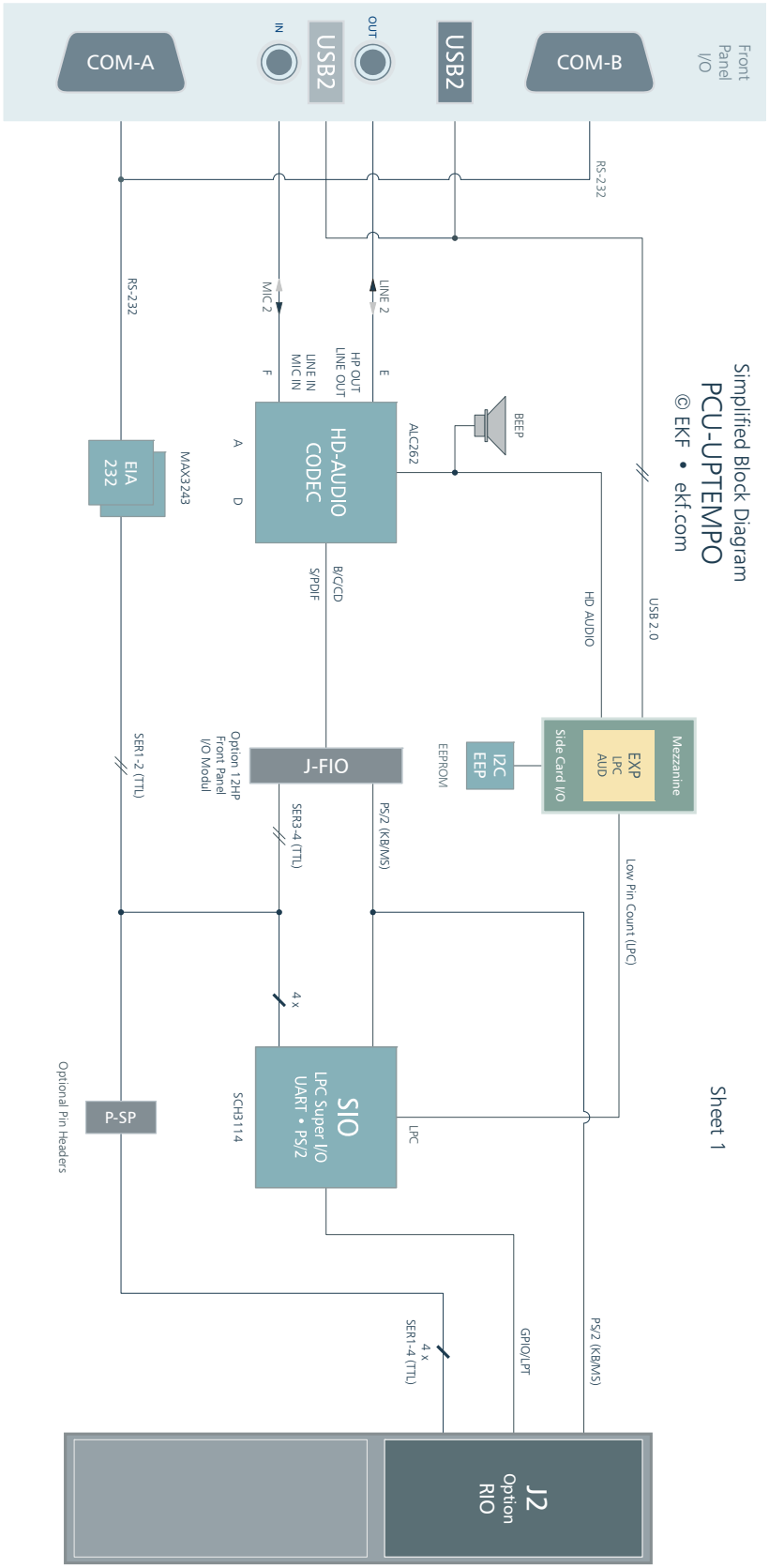
The HSE mezzanine connector passes up to two 6G SATA channels from the PC6-TANGO CPU carrier to the PCU-UPTEMPO side board. The SATA ports are wired from the HSE connector to associated M.2 module host connectors.

The mezzanine connector EXP combines several side-band data channels: The HD Audio interface is a data path to the on-board audio codec. The LPC (Low Pin Count) enables the super-I/O (SIO) controller chip to emulate the legacy I/O interfaces; among these are the serial (COM) ports. Two USB 2.0 ports are wired to front panel receptacles (one of them as an alternate stuffing option to the audio jacks).

The on-board SIO is tied to the LPC interface provided by the EXP side card mezzanine connector. The SIO comprises legacy I/O circuitry such as UART, PS/2, and GPIO. The four serial interfaces (UART) of the SIO are available for front panel I/O (EIA-232 D-Sub), and either mezzanine modules or rear I/O usage (TTL-level).

The PCU-UPTEMPO fits on the top side of the CPU board, which is on the right side when viewing the common 8HP front panel. A suitable backplane provides its CompactPCI® slots beginning with the CPU carrier board (CompactPCI® system slot) from right to left. The CompactPCI® system rack must provide additional mounting space to the right side for the PCU-UPTEMPO. In addition, a single slot rear I/O backplane would be needed for rear I/O usage, and a also custom specific rear I/O transition module.

Block Diagram



Simplified Block Diagram
PCU-UPTEMPO
© EKF • ekf.com

Sheet 2

Summary of Connectors

Not all of the connectors or other elements listed below may be present or functional on your actual PCU-UPTEMPO board. Assembly of these connectors is highly custom specific. Discuss your needs (target application) with EKF before ordering, for an optimum CPU & side card configuration.

Front Panel Connectors

AUDIO-IN	3.5mm stereo audio jack, analog audio, software configurable (default = MIC input)
AUDIO-OUT	3.5mm stereo audio jack, analog audio, software configurable (default = HP output)
COM-A, -B	Male D-SUB 9-position, RS-232E
USB 2.0 (upper)	USB 2.0 Type-A receptacle
USB 2.0 (lower)	USB 2.0 Type-A receptacle (alternatively available, requires AUDIO jacks not populated)

On-Board Connectors

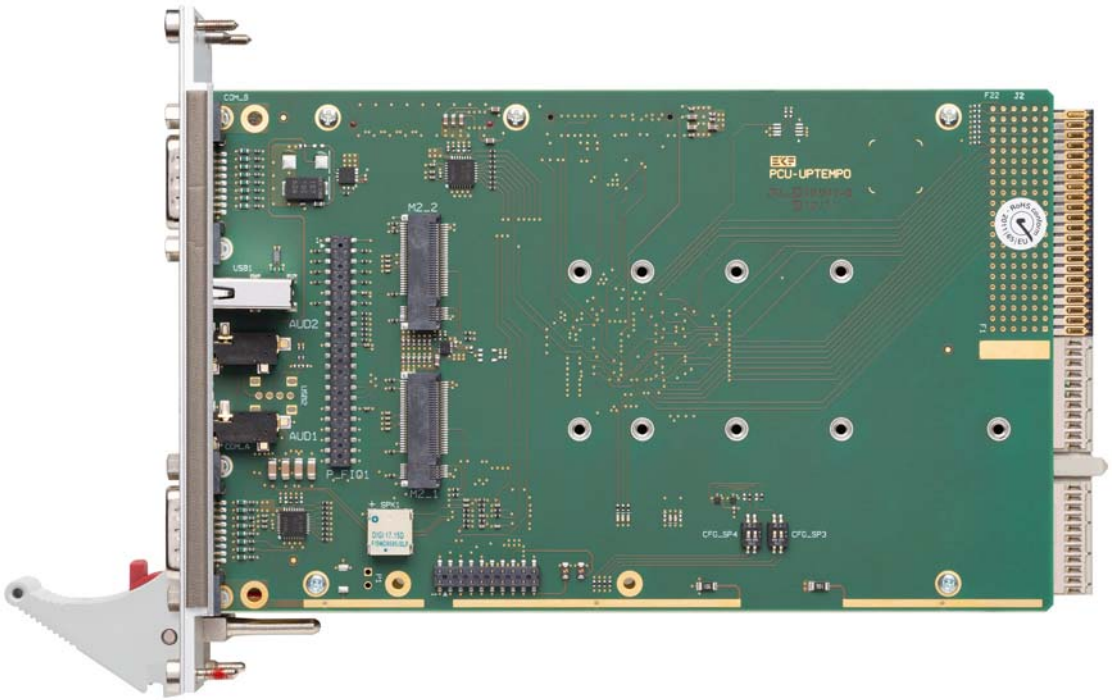
FIO	Option, 12HP front panel I/O mezzanine connector suitable for the C32-FIO module (UART, USB, PS/2)
M.2 1 (lower socket)	M.2 (formerly NGFF) host connector, B-keyed, 4.2H, for an M.2 SATA SSD module, dimension up to 22110, M.2 S1 - S5 (single sided module) and M.2 D1 - D5 (double sided module) component height, wired to the HSE mezzanine connector SATA port 1 (on the PC6-TANGO carrier card this is an APL-I SoC port)
M.2 2 (uper socket)	M.2 (formerly NGFF) host connector, B-keyed, 4.2H, for an M.2 SATA SSD module, dimension up to 2280, M.2 S1 - S5 (single sided module) and M.2 D1 - D5 (double sided module) component height, wired to the HSE mezzanine connector SATA port 2 (on the PC6-TANGO carrier card this is a dedicated SATA controller port which may be optional populated)
SP	Dual row 2.0mm pitch socket, providing TTL-level serial COM port signals, may be used for attachment of SU*-series PHY modules

Inter-Board Connectors (CPU Carrier)

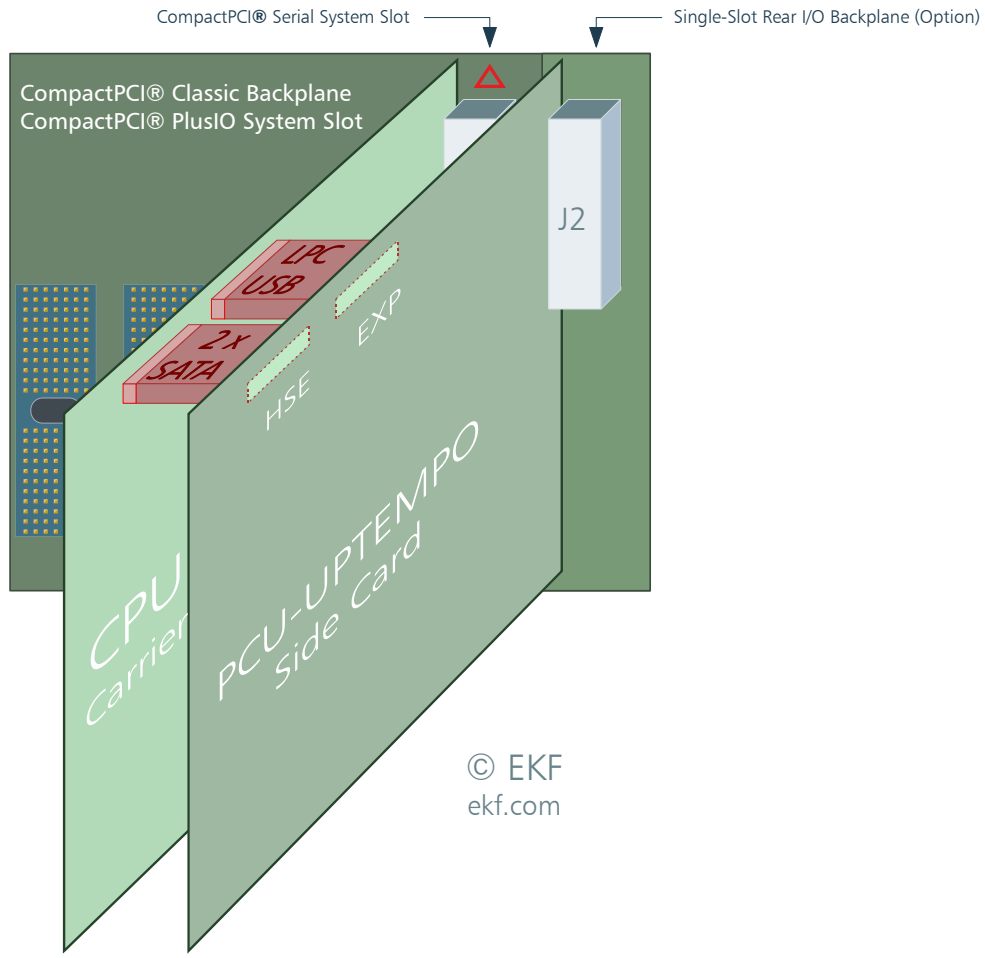
EXP	Dual row socket, located on the bottom of the PCU-UPTEMPO PCB, mating with the corresponding socket on the CPU carrier board, connected through a board stacker, comprised of: ▸ LPC Low Pin Count interface, in use for the on-board SIO ▸ HD Audio (Azalia), wired to an on-board codec ▸ 2 x USB 2.0, wired to front panel receptacles ▸ SMB, Speaker, Reset
HSE	High speed mezzanine connector, located on the bottom of the PCU-UPTEMPO PCB, mating with the corresponding connector on the CPU carrier board, comprising of: ▸ Host CPU (PCH) SATA1 & SATA2 (discrete SATA controller) ports

Rear I/O Connector

J2 Option	Rear I/O option 2.00mm hard metric female connector ▸ 4 x GPIO derived from SIO and 4 x GPIO from USB 3.0 controller ▸ LPT parallel port ▸ Serial ports (UART TTL-level signals) ▸ PS/2 keyboard & mouse ▸ SMB, Speaker, Reset#



Backplane Mounting



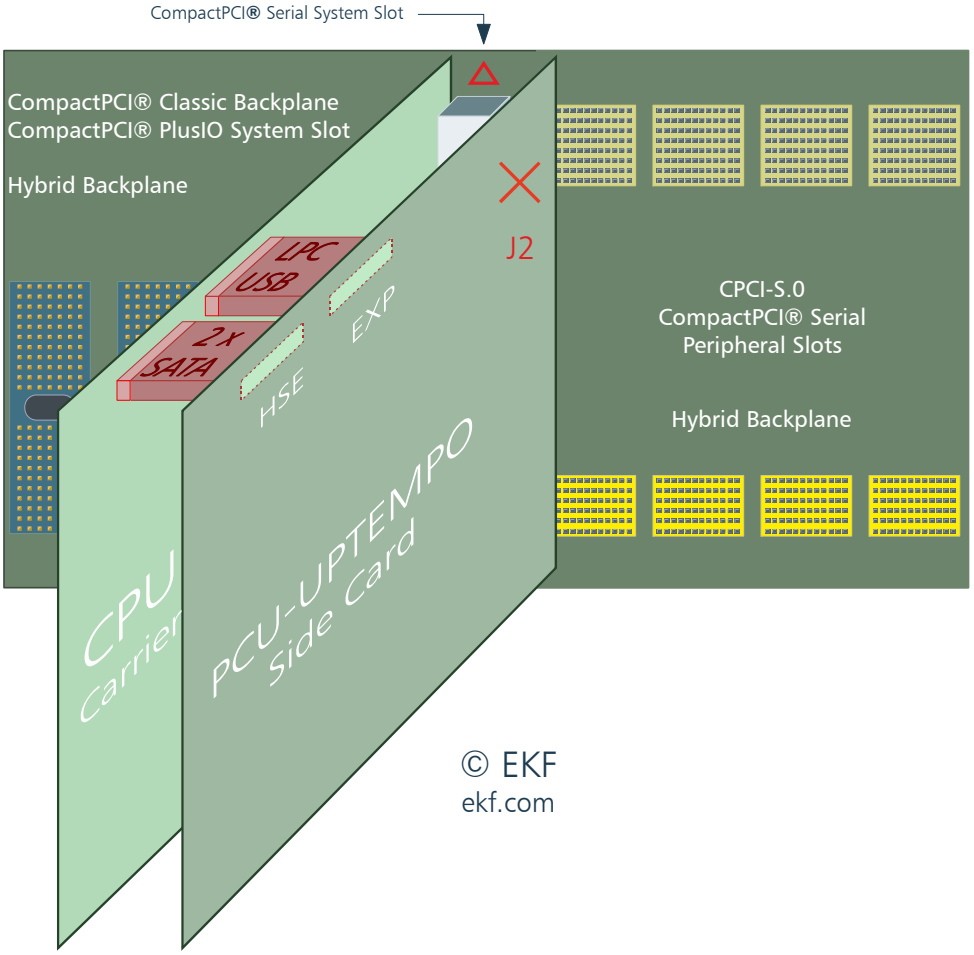
RIO Option with CompactPCI and CompactPCI PlusIO

The PCU-UPTEMPO comes as an assembly together with the CompactPCI® PlusIO CPU carrier card PC6-TANGO, or other CPU boards.

If the backplane is provided with a right aligned system slot, be sure to position the CPU carrier board to system slot (and not the PCU-UPTEMPO side card). Consequently, the PCU-UPTEMPO then occupies the next card cage slot to the right, outside of the backplane shape.

This assembly order (right aligned backplane system slot) is recommended because no regular CompactPCI® or CompactPCI® Serial backplane peripheral slot would get lost for the PCU-UPTEMPO.

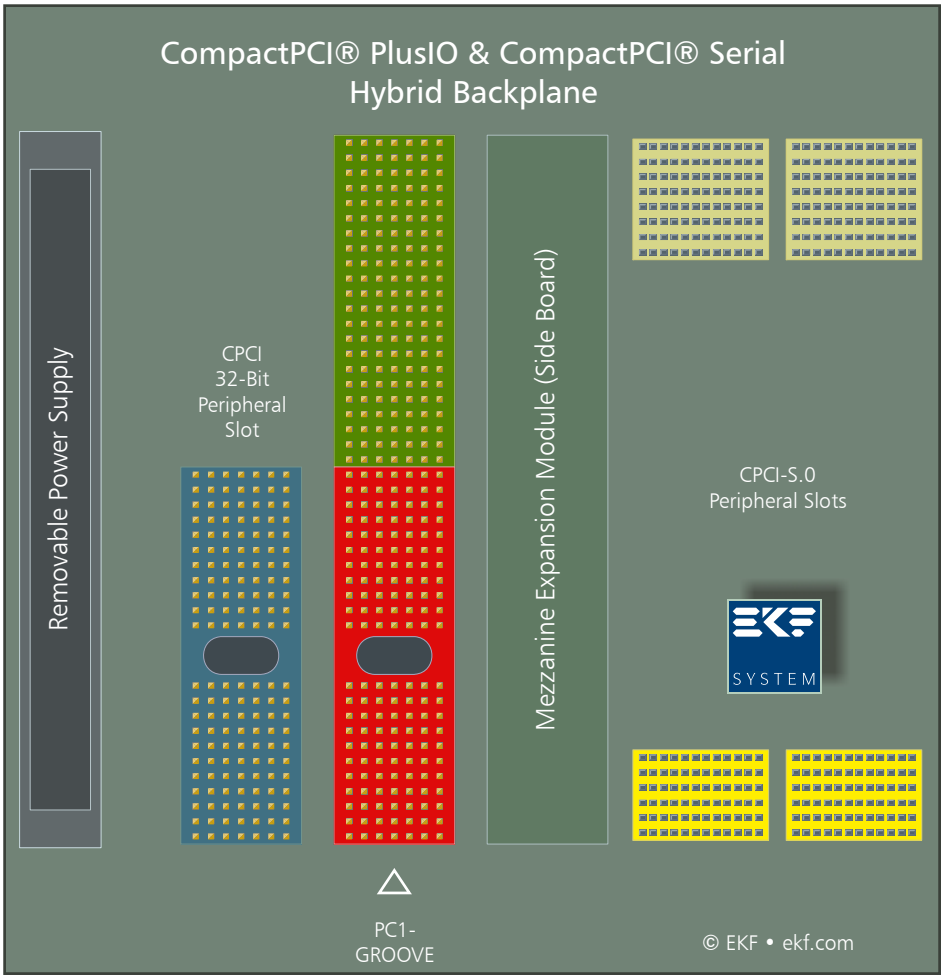
A single slot rear I/O P2 backplane would be required in addition to make use of the rear I/O capability of the PCU-UPTEMPO, by means of a custom specific rear I/O module. J2 must be populated for rear I/O.



4HP RIO Not Available w. CompactPCI Serial

Combined with a typical hybrid backplane equipped with slots for both CompactPCI® Classic and CompactPCI® Serial, the PCU-UPTEMPO may not be used for rear I/O (J2 not populated), and the most left CompactPCI® Serial peripheral slot would get lost.

A custom specific hybrid backplane however can solve this situation, with the CompactPCI® Serial peripheral slots moved 20.32mm (4HP) away, thus providing empty space for the PCU-UPTEMPO side card (see illustration on the next page).



Sample Proprietary Hybrid Backplane (with Side Card Spare Slot)

Installing and Replacing Components

Before You Begin

Warnings

The procedures in this chapter assume familiarity with the general terminology associated with industrial electronics and with safety practices and regulatory compliance required for using and modifying electronic equipment. Disconnect the system from its power source and from any telecommunication links, networks or modems before performing any of the procedures described in this chapter. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage. Some parts of the system can continue to operate even though the power switch is in its off state.

Caution

Electrostatic discharge (ESD) can damage components. Perform the procedures described in this chapter only at an ESD workstation. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis or board front panel. Store the board only in its original ESD protected packaging. Retain the original packaging (antistatic bag and antistatic box) in case of returning the board to EKF for repair.

Installing the Board

Warning

This procedure should be done only by qualified technical personnel. Disconnect the system from its power source before doing the procedures described here. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage.

Typically you will perform the following steps:

- Switch off the system, remove the AC power cord
- Attach your antistatic wrist strap to a metallic part of the system 
- Remove the board assembly packaging, be sure to touch the board only at the front panel
- Identify the related CompactPCI slot (peripheral slot for I/O boards, system slot for CPU boards, with the system slot typically most right or most left to the backplane)
- Insert card carefully (be sure not to damage components mounted on the bottom side of the board by scratching neighboured front panels)
- A card with onboard connectors requires attachment of associated cabling now
- Lock the ejector lever, fix screws at the front panel (top/bottom)
- Retain original packaging in case of return

Removing the Board

Warning

This procedure should be done only by qualified technical personnel. Disconnect the system from its power source before doing the procedures described here. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage.

Typically you will perform the following steps:

- Switch off the system, remove the AC power cord
- Attach your antistatic wrist strap to a metallic part of the system
- Identify the board, be sure to touch the board only at the front panel
- Unfasten any front panel screws (top/bottom), unlock the ejector lever
- Remove any onboard cabling assembly
- Activate the ejector lever
- Remove the card assembly carefully (be sure not to damage components mounted on the bottom side of the board by scratching neighboured front panels)
- Store board in the original packaging, do not touch any components, hold the board at the front panel only

Warning

Do not expose the card to fire. Battery cells and other components could explode and cause personal injury.

EMC Recommendations

CE

In order to comply with the CE regulations for EMC, it is mandatory to observe the following rules:

- The chassis or rack including other boards in use must comply entirely with CE
- Close all board slots not in use with a blind front panel
- Front panels must be fastened by built-in screws
- Cover any unused front panel mounted connector with a shielding cap
- External communications cable assemblies must be shielded (shield connected only at one end of the cable)
- Use ferrite beads for cabling wherever appropriate
- Some connectors may require additional isolating parts

Reccomended Accessories

Blind CPCI Front Panels	EKF Elektronik	Widths currently available (1HP=5.08mm): with handle 4HP/8HP without handle 2HP/4HP/8HP/10HP/12HP

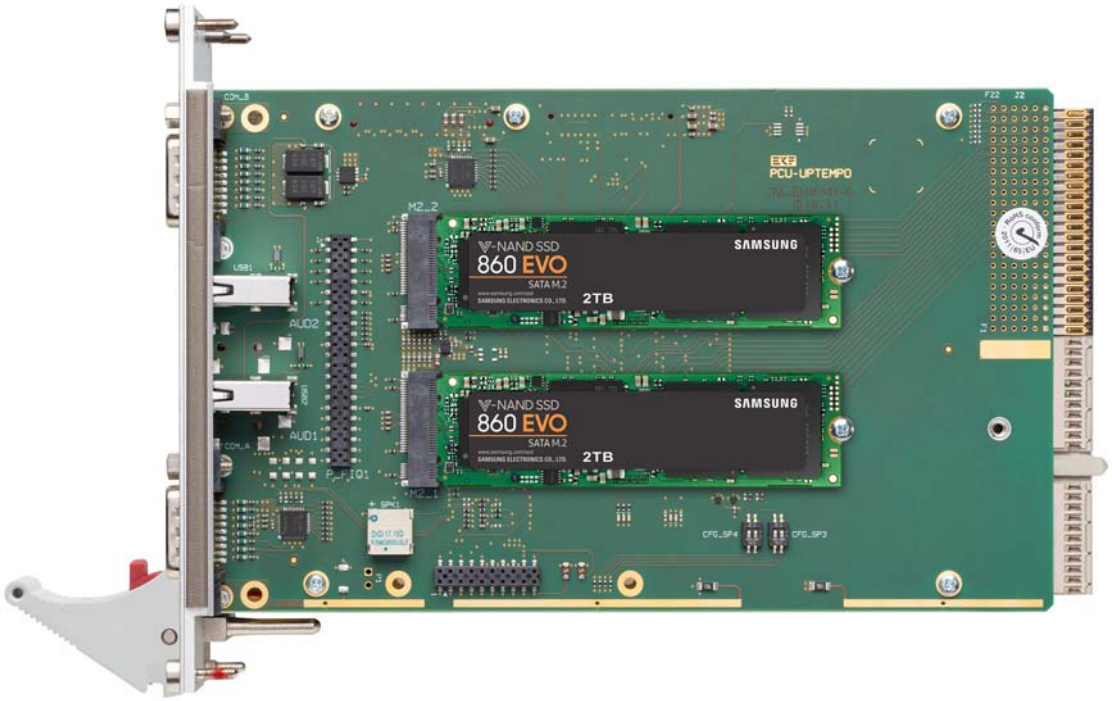
Technical Reference

Caution

Some of the connectors may provide operating voltage (e.g. +12V, +5V and +3.3V) to devices inside the system chassis, such as internal peripherals. Not all of these connectors are overcurrent protected. Do not use these connectors for powering devices external to the computer chassis. A fault in the load presented by the external devices could cause damage to the board, the interconnecting cable and the external devices themselves.

Please Note

The PCU-UPTEMPO mezzanine module may be equipped with several on-board connectors for system internal usage. Not all of these connectors may be present on a particular board. Be sure to specify your individual needs when ordering the PCU-UPTEMPO board. Characteristic features and the pin assignments of each connector are described on the following pages (connector designation in alphabetical order within the groups 'front panel connectors', 'on-board connectors', 'inter-board connectors', and 'rear I/O connectors').



Front Panel Connectors

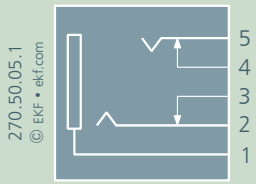
AUDIO IN/OUT

The PCU-UPTEMPO is optionally equipped with an ALC262 HD Audio Codec, controlled directly by the SoC (CPU) or PCH (Platform Controller Hub) on the CPU carrier board via the Intel Azalia HDA link. Two 3.5mm stereo audio jacks are available from the PCU-UPTEMPO front panel for attachment of audio devices such as audio power amplifier, headphones, microphone.

The particular function of each audio jack is controlled by the driver software (e.g. Realtek). By default, the AUDIO IN audio jack is configured as microphone input, and the AUDIO OUT jack is suitable for headphones ≥32 Ohms. Other configurable options are line in and line out. The typical full scale input voltage is 1.5V_{rms} (input resistance ≥10kOhm), and the typical full scale output voltage is 1.4V_{rms} (10 kOhm / 50pF external load).

The difference between headphones out mode and line out mode is mainly the low output impedance of 1 Ohm when in HP mode, compared to 200 Ohms in line out mode. This is also useful for noise immunity when long external audio cables are required. For optimum THD however chose line out mode.

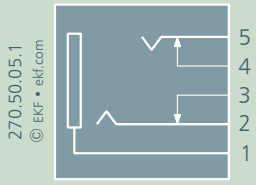
AUDIO OUT • Stereo Audio Jack
3.5mm (270.50.05.1)



Stereo Audio Jack
3.5mm

	HeadPhones Out
1	AGND
2	ALC262 Port E Input/Output Signal Right
3	AGND
4	AGND
5	ALC262 Port E Input/Output Signal Left

AUDIO IN • Stereo Audio Jack
3.5mm (270.50.05.1)

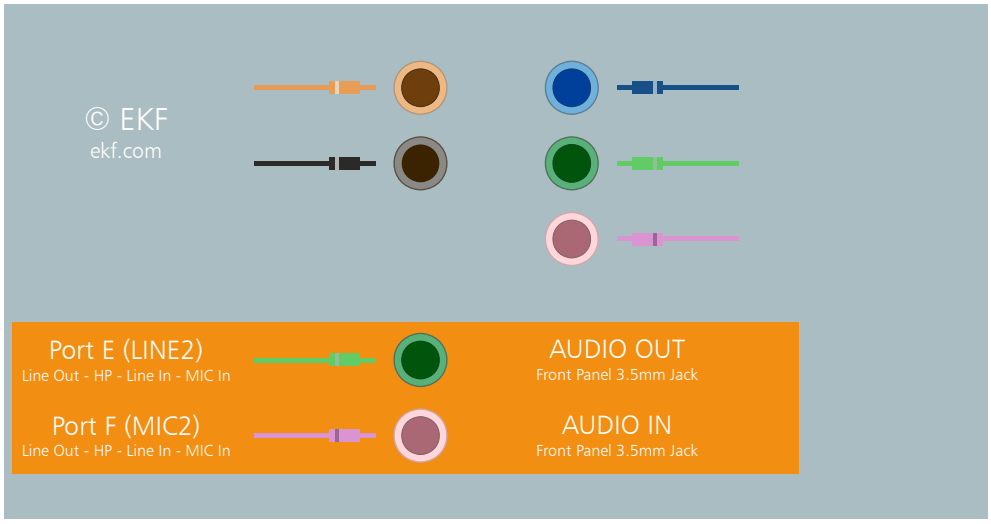


Stereo Audio Jack
3.5mm

	MIC In
1	AGND
2	ALC262 Port F Input/Output Signal Right
3	AGND
4	AGND
5	ALC262 Port F Input/Output Signal Left

ALC262 Port Configuration - 3.5mm Audio Jacks					
Port	Name	LINE OUT / HP	LINE IN	MIC	Connector
E	LINE2	✓	✓	✓	Audio Out
F	MIC2	✓	✓	✓	Audio In

The assignment of input or output to the audio jacks is highly ambiguous, due to the software configurable ports E and F of the ALC262. For details of the ALC262 and latest HD Audio driver software, please refer to www.realtek.com.tw.



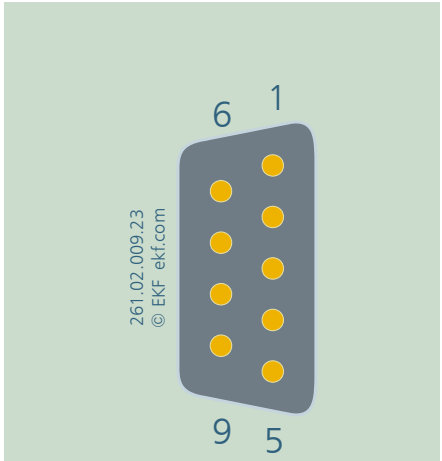
Realtek Audio Driver Analog Configurations - Front Panel Stereo Jacks 3.5mm

Some more audio ports are wired to the on-board connector FIO, for future use on a custom mezzanine card.

COM

The on-board secondary Super-I/O (SIO) on the PCU-UPTEMPO provides four asynchronous serial interfaces, two of them available from the front panel (EIA/TIA 232). The other two (TTL-level) are available either via an on-board connector, or at the optional J2 rear I/O connector, or can be used across J-FIO on the C32-FIO mezannine board.

Due to other UARTs potentially available on the CPU host board, the serial interfaces of the PCU-UPTEMPO are not necessarily assigned as COM-1/COM-4 via Windows. Verify or modify the accompanying CPU BIOS settings for mapping of physical asynchronous serial I/O ports to the logical COM port order. Being ignorant of the actual port mapping, the serial port front panel connector is marked neutrally as COM-A and COM-B (COM-C and COM-D in addition when using the optional C32-FIO mezzanine board).



COM-A & COM-B • RS-232 Male D-Sub 9 (261.02.009.23)				
			1	DCD 1/2
	DSR 1/2	6		
			2	RXD 1/2
	RTS 1/2	7		
			3	TXD 1/2
	CTS 1/2	8		
			4	DTR 1/2
	RI 1/2	9		
			5	GND

The on-board ESD protected RS-232E transceivers MAX3243E on the PCU-UPTEMPO will allow a bit rate of up to 500kbps.

In addition, all serial ports are also available for rear I/O across J2, as an option. When using the serial port 1 or 2, there is a conflict with the on-board EIA-232 transceivers (COM-A). Hence, in order to avoid signal interference, the on-board MAX3243E serial transceiver must not be stuffed or disabled, for signal usage of the serial port 1 and 2 on a rear I/O transition module. Consider usage of the serial ports 3 and 4 as an alternate to the serial port 1 and 2 for rear I/O. However, if the C32-FIO mezzanine module is engaged on the PCU-UPTEMPO, the serial ports 3/4 are also in use for additional EIA-232 transceivers and C32-FIO front panel D-SUB connectors (COM-C, COM-D). If in doubt, please discuss your individual requirements with sales@ekf.de before ordering.

USB

The PCU-UPTEMPO is equipped with either one or two USB 2.0 Type-A front panel receptacles. The lower USB connector is optional, and only available when the audio jacks are not populated.

Both front panel USB jacks are tied to the mezzanine connector EXP, and are wired on the PC6-TANGO CPU carrier card directly to the APL-I SoC (on other CPU boards the PCH).

USB1 & USB2 • USB 2.0 Receptacles Type-A (270.20.04.2)		
 USB 2.0 Receptacle © EKF • ekf.com • #270.20.04.2	1	VBUS +5V/1.5A
	2	USB D-
	3	USB D+
	4	GND

Each connector provides+5V (VBUS) for powering external devices. A dual-channel electronic power switch (TPS2060) is used on the PCU-UPTEMPO which limits the maximum output current of each individual USB connector to a safe level. The USB power switch is rated at >2A current limit typically, which is suitable even for applications where heavy capacitive loads are likely to be encountered, e.g. VBUS powered USB disk drives.

On-Board Connectors

FIO

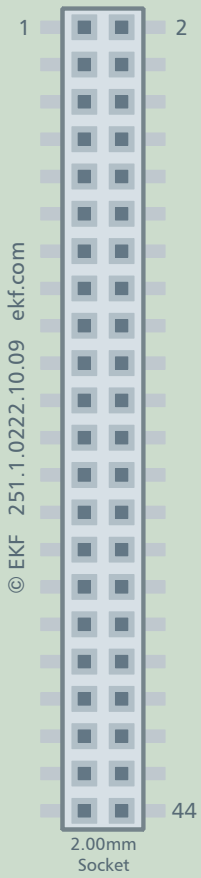
As an option, the PCU-UPTEMPO can be expanded by a small front panel I/O mezzanine module, the C32-FIO. This requires a 12HP front panel in total (CPU carrier, PCU-UPTEMPO, C32-FIO). The C32-FIO provides two additional COM-Ports.

FIO is a 2mm pitch dual row socket on top of the PCU-UPTEMPO, which connects to the C32-FIO by means of a board stacker element.

For a description of the C32-FIO mezzanine module refer to www.ekf.com/c/ccpu/c32/c32_tie.pdf.

FIO • Secondary I/O Mezzanine Expansion Interface (Audio - COM - PS/2)

2.00mm Socket 2 x 22 (251.1.0222.10.09)



GND	1	2	+3.3V_S *
SP4_RI#	3	4	SP4_DSR#
SP4_TXD	5	6	SP4_RXD
SP4_RTS#	7	8	SP4_DTR#
SP4_DCD#	9	10	SP4_CTS#
GND	11	12	+3.3V_S *
SP3_RI#	13	14	SP3_DSR#
SP3_TXD	15	16	SP3_RXD
SP3_RTS#	17	18	SP3_DTR#
SP3_DCD#	19	20	SP3_CTS#
GND	21	22	+5V_S *
NC	23	24	*NC*
NC	25	26	*NC*
NC	27	28	*NC*
PS/2 Clock Keyboard	29	30	PS/2 Clock Mouse
PS/2 Data Keyboard	31	32	PS/2 Data Mouse
GND	33	34	+5V_A
S/PDIF_IN	35	36	*S/PDIF_OUT*
CD_L	37	38	*CD_R*
LINE1_L	39	40	*MIC1_L*
Analog GND	41	42	*CD_GND*
LINE1_R	43	44	*MIC1_R*

* switched power supply lines from CPU carrier board according to Sx state

The SP3/SP4 serial port signals (UART TTL-level) are shared with the on-board connector SP and the rear I/O option connector J2, and must be used for one destination only in order to avoid signal interference. The PS/2 KB/MS signals are shared with the rear I/O option connector J2, and must also be used for one destination only.

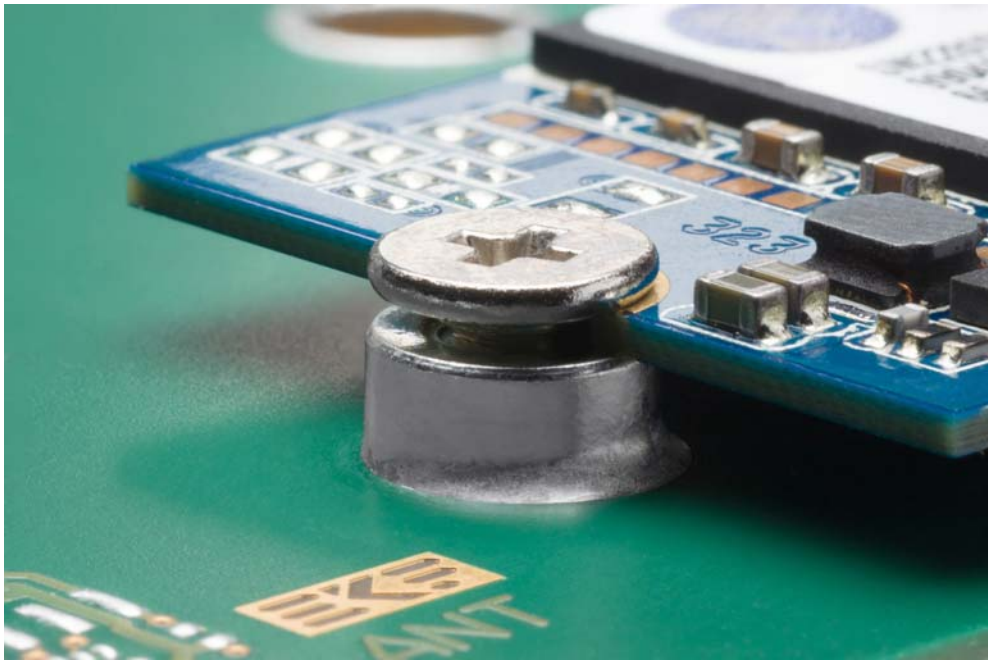
The audio signals (pins 35-44) are not in use on the C32-FIO mezzanine module but may be used for a custom mezzanine card.

M.2 SSD Host Connectors

The PCU-UPTEMPO is provided with two M.2 (formerly NGFF) module host connectors. Both sockets ar B-keyed for AHCI SATA type SSD modules. After inserted, the M.2 module must be locked manually by a screw (M2.5 threaded inserts provided on the PCB), in order to withstand shock and vibration. The PCU-UPTEMPO accepts module sizes up to 22110 on the M.2 socket 1 (lower socket), and up to 2280 on the upper M.2 connector 2. With respect to the top and bottom component height, the 4.2H M.2 sockets are suitable for nearly any module styles (labels), S1 - S5 and D1 - D5, according to the PCI Express M.2 Specification (Figure 3 Naming Nomenclature).

Both M.2 host connectors can be used independent of each other. Single and dual SSD operation is supported. The preferred M.2 socket is 1 (lower position), since it is wired directly to the APL-I when the PC6-TANGO is used as a CPU carrier card. The upper M.2 connector 2 is tied to the Marvell SATA controller, which may not be stuffed on all PC6-TANGO SKUs.

Both M.2 host connectors provide +3.3V to the M.2 modules, which is originally derived from +3.3V_S (see mezzanine connectors HSE and EXP), and passed across an electronic load switch, for short-circuit protection and undervoltage lockout. The maximum permanent current consumption of both M.2 SSD modules together should not exceed 3A.



M.2 Module Fixation (Picture Similar)

AHCI SATA M.2 B-Key 4.2H • Pin 1 - 38 EKF Part #255.50.1.2242.10			
CFG-3 *	1	2	+3.3V
GND	3	4	+3.3V
GND	5	6	NC
NC	7	8	NC
NC	9	10	DAS/DSS **
GND	11	12	B Key
B Key	13	14	B Key
B Key	15	16	B Key
B Key	17	18	B Key
B Key	19	20	NC
CFG-0 *	21	22	NC
NC	23	24	NC
NC	25	26	NC
GND	27	28	NC
NC	29	30	NC
NC	31	32	NC
GND	33	34	NC
NC	35	36	NC
NC	37	38	DEVSLP **

* 10k pull-up +3.3V

** 10k pull-down to GND

AHCI SATA M.2 B-Key continued • Pin 39 - 75			
GND	39	40	*SMB_CLK*
SATA B+ (SSD OUT)	41	42	*SMB_DATA*
SATA B- (SSD OUT)	43	44	*ALERT#*
GND	45	46	NC
SATA A- (SSD IN)	47	48	NC
SATA A+ (SSD IN)	49	50	NC
GND	51	52	NC
NC	53	54	NC
NC	55	56	RSV
GND	57	58	RSV
NC M-Key	59	60	NC M-Key
NC M-Key	61	62	NC M-Key
NC M-Key	63	64	NC M-Key
NC M-Key	65	66	NC M-Key
NC	67	68	*SUSCLK*
CFG-1 *	69	70	+3.3V
GND	71	72	+3.3V
GND	73	74	+3.3V
CFG-2 *	75		

* 10k pull-up +3.3V

PCI Express® M.2 Specification Socket 2 Key B-M SATA-based SSD Module Pinout

SP

The on-board SIO (Super I/O controller) provides up to four serial interfaces (UART, DOS COM ports). While the serial ports SP1 and SP2 are typically assigned to the front panel RS-232 COM port connectors COM-A and COM-B via RS-232 tranceiver circuits, another two UART ports are available in addition from the optional on-board socket SP, as TTL-level signals. This connector is suitable for attachment of one or two EKF SU*-series PHY modules via a micro ribbon flat cable assembly. A PHY module is a transceiver from TTL level signals to a specific symmetric or asymmetric interface standard, e.g. EIA-485 or RS-232E.

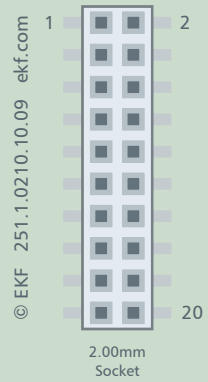
SUE-RS232	Isolated RS-232 module, front connector Micro-D 9-position
SUF-RS485	Isolated RS-485 module, front connector Micro-D 9-position
SUG-RS232	Isolated RS-232 module, front connector RJ45
SUH-RS485	Isolated RS-485 module, front connector RJ45
SUI-RS232	Isolated RS-232 module, front connector standard D-SUB 9-position
SUJ-RS485	Isolated RS-485 module, front connector standard D-SUB 9-position

EKF offers suitable modules with galvanic isolation. With a 12HP assembly, these modules can be mounted into the front panel. Please contact sales@ekf.de for availability of different SU-series modules (inquiries for custom specific PHY or transition modules welcome). Also custom specific front panel design can be done.

Please note, that the UART ports SP3 and SP4 are also wired as TTL signal for optional usage on the FIO connector (C32-FIO mezzanine card), and to the rear I/O connector J2. In order to avoid signal interference and malfunction, any serial port must be assigned to one destination only.

Alternatively the signals wired to the connector SP may be used as 5V tolerant programmable I/O (GPIO). Details can be derived from the SCH3114 Super I/O controller data sheet (www.smsc.com).

SUH-RS485 • SUG-RS232 • RJ45 Connector

SP • TTL-Level Serial I/O or GPIO 2mm low profile socket • 251.1.0210.10.09				
	+5V_S 1)	1	2	GND
	RTS3# / GP17	3	4	RXD3 / GP10
	TXD3 / GP11	5	6	+3.3V_S
	DE3	7	8	CTS3# / GP16
	RE3#	9	10	GND
	RE4#	11	12	GND
	DE4	13	14	CTS4# / GP62
	TXD4 / GP65	15	16	+3.3V_S
	RTS4# / GP67 2)	19	18	RXD4 / GP64
	+5V_S 1)	19	20	GND

1) short circuit protection by a PolySwitch resettable fuse, voltage derived from +5V_S carrier board switched power well

2) RTS4# (GP67) may be in use as WP (write protect) signal for board configuration EEPROM.

The connector SP is wired for a simplified UART handshake scheme - the sideband signals DCD, DSR, DTR and RI have been omitted since not required for the EKF SU* modules. Hardware handshake is established by CTS/RTS only.

SUE-SUJ • Isolated RS-232 & RS-485 Transceiver Modules

On-Board Jumpers

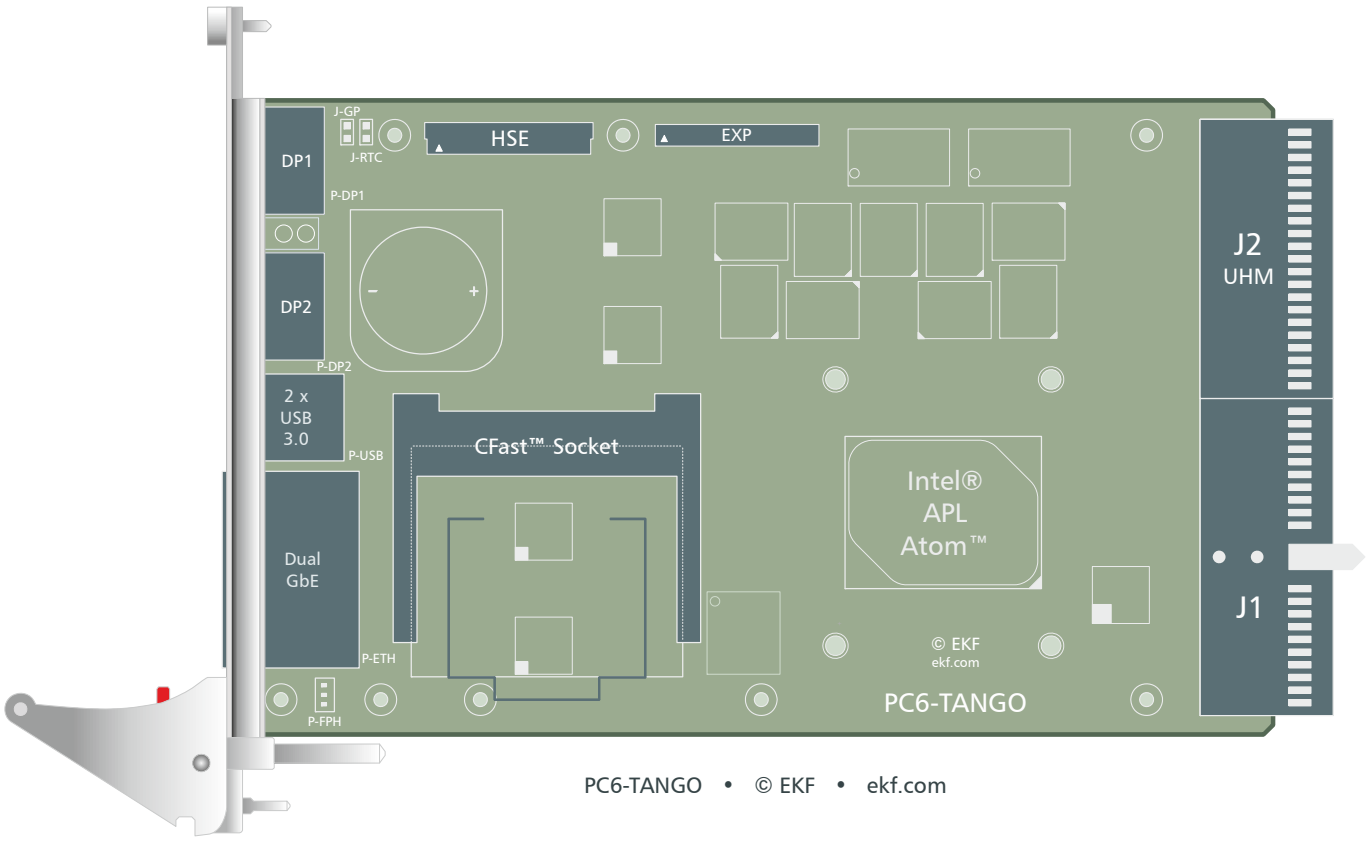
Reset

Provided as an option, the pin header P1 can be used for resetting the CPU host board (processor reset) if wired to additional circuitry (e.g. watchdog or manual pushbutton). Tie reset# to GND with an open collector output. While debugging the system, a 2.54mm jumper may be used to force a manual reset.

Inter-Board Connectors

The PCU-UPTEMPO is equipped with two inter-board connectors. These are the EXP (LPC and mixed signals), and the HSE (SATA) connectors. All host CPU inter-board connectors are situated at the bottom of the PCU-UPTEMPO and establish the data path and power link to the carrier board CPU.

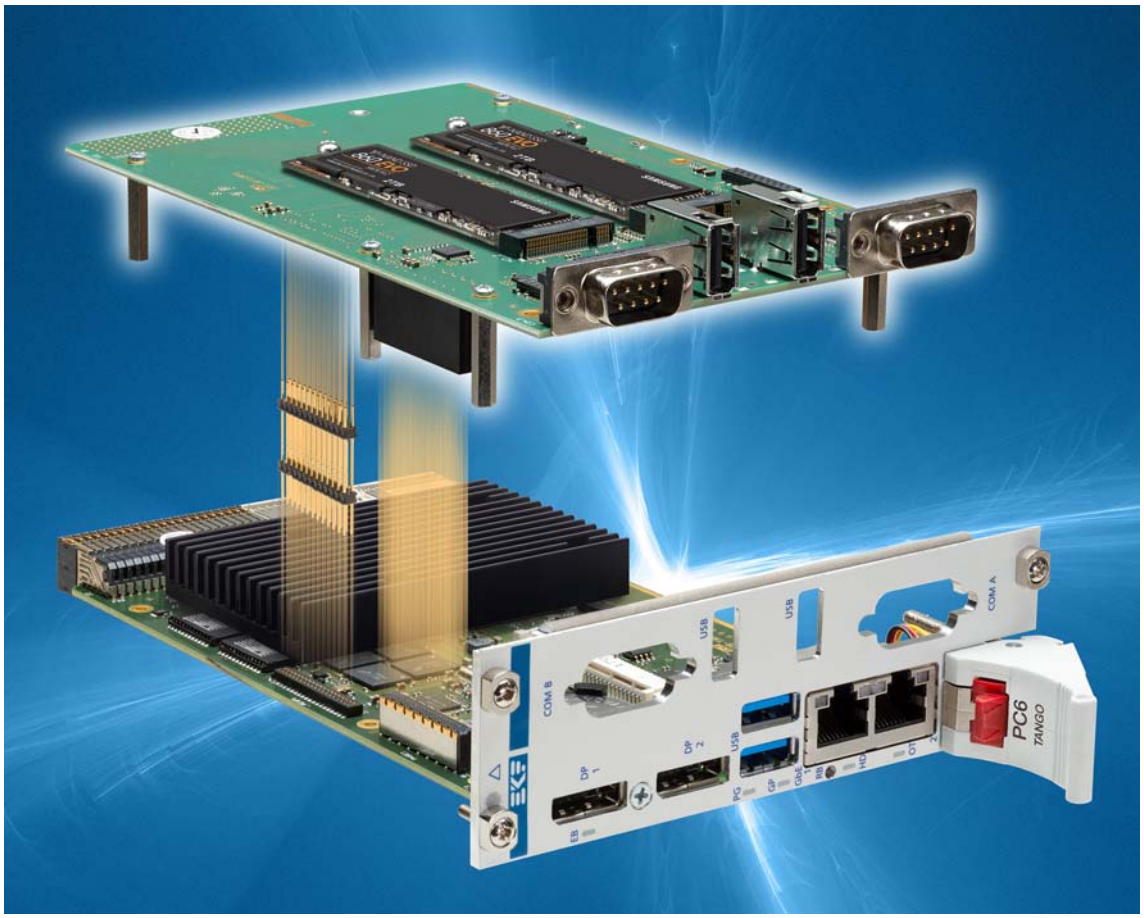
As the PCU-UPTEMPO comes typically mounted as a unit together with the PC6-TANGO or (or other carrier board), there is normally no need for the user to get access to any of the inter-board connectors. They are described here as a reference only and for better understanding of the PCU-UPTEMPO.



PC6-TANGO • © EKF • ekf.com

EXP	
I/F Type	PC6-TANGO Controller
LPC (Low Pin Count)	APL-I SoC
HD Audio	APL-I SoC
I2C	APL-I SoC I2C Port 0
2 x USB 2.0	APL-I SoC

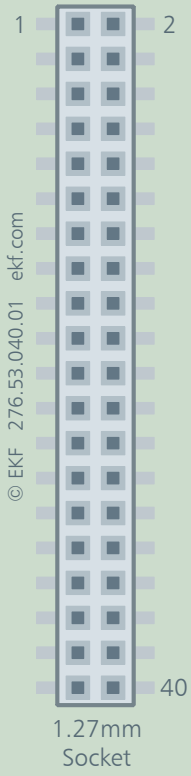
HSE	
I/F Type	PC6-TANGO Controller
SATA1 (6G)	APL-I SoC
SATA2 (6G)	Marvell SATA Controller (Option)



EXP

The inter-board connector EXP is mounted on bottom of the PCU-UPTEMPO PCB. This allows to attach the PCU-UPTEMPO mezzanine companion card on top of the CPU carrier board. A suitable board stacker is used in addition to bridge the gap between the two boards (exactly 4HP distance between PCBs). EXP is used to pass the Low Pin Count I/F to the PCU-UPTEMPO, besides two USB channels and some sideband signals.

EXP • Expansion Board Interface (LPC/HD-Audio/USB)
1.27mm Socket 2 x 20 (276.53.040.01)



pin orientation shows
CPU carrier board top view

GND	1	2	+3.3V_S *
LPC_CLK	3	4	PLTRST#
LPC_AD0	5	6	LPC_AD1
LPC_AD2	7	8	LPC_AD3
LPC_FRAME#	9	10	LPC_DRQ#
GND	11	12	+3.3V_S *
SERIRQ	13	14	PME#
SMI#	15	16	CLK_14MHZ
UART_TXD	17	18	*UART_RXD*
KBD_RST#	19	20	A20GATE
GND	21	22	+5V_S *
USB2_DN	23	24	USB1_DN
USB2_DP	25	26	USB1_DP
USB_OC#	27	28	DBRESET#
I2C_SCL	29	30	I2C_SDA
GND	31	32	+5V_S *
HDA_SDOUT	33	34	HDA_SDIN0
HDA_RST#	35	36	HDA_SYNC
HDA_BITCLK	37	38	*NC*
SPEAKER	39	40	+12V_A **

signals shown italic/gray not in use

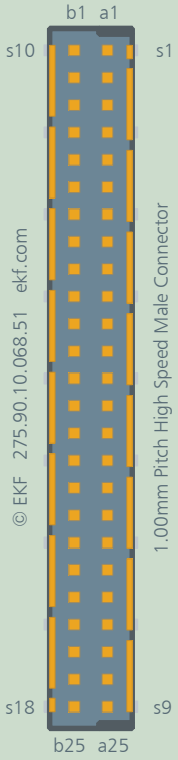
* switched power supply lines from CPU carrier board according to Sx state

** available only in systems which provide +12V via backplane to the CPU carrier card

HSE

The connector HSE is a 10mm height shielded male pin header. Its counterpart on the CPU carrier board is a 8mm height receptacle, for a nominal headroom of 18.72mm between the boards (equivalent to 4HP board to board CL pitch).

HSE • SATA Ports Mezzanine Interface
1.00mm Pitch Male Connector 10mm Height (275.90.10.068.51)



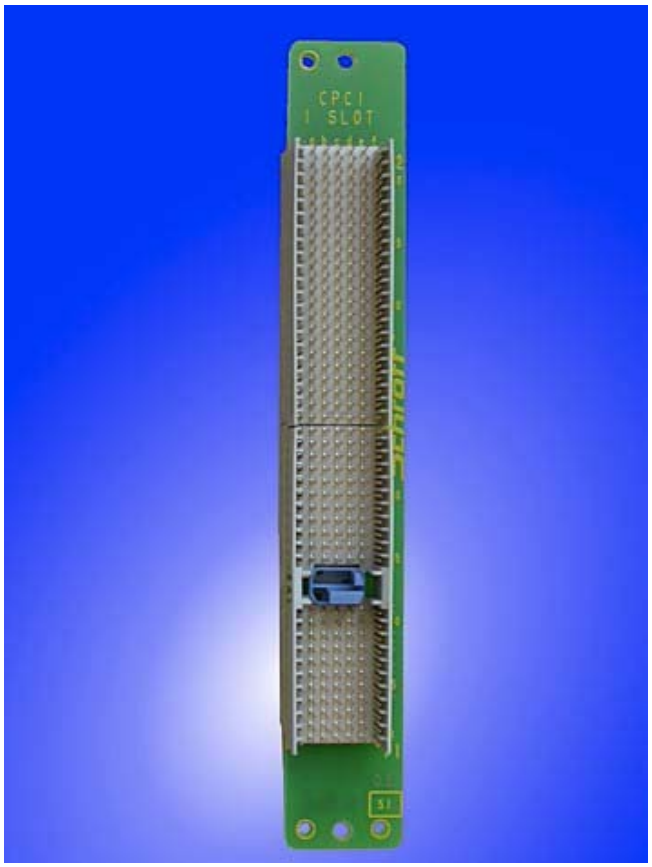
GND	b1	a1	GND
NC	b2	a2	SATA1_TXP 4)
NC	b3	a3	SATA1_TXN 4)
GND	b4	a4	GND
NC	b5	a5	SATA1_RXN 4)
NC	b6	a6	SATA1_RXP 4)
GND	b7	a7	GND
NC	b8	a8	SATA2_TXP 5)
NC	b9	a9	SATA2_TXN 5)
GND	b10	a10	GND
NC	b11	a11	SATA2_RXN 5)
NC	b12	a12	SATA2_RXP 5)
GND	b13	a13	GND
NC	b14	a14	*NC*
NC	b15	a15	*NC*
GND	b16	a16	GND
NC	b17	a17	*NC*
NC	b18	a18	*NC*
GND	b19	a19	GND
NC	b20	a20	*NC*
NC	b21	a21	*NC*
+5V_S 1)	b22	a22	+3.3V_S 1)
+5V_S 1)	b23	a23	+3.3V_S 1)
+5V_A 2)	b24	a24	+3.3V_A 2)
+12V_A 2) 3)	b25	a25	+12V_A 2) 3)

1) Switched voltages from carrier board, according to CPU sleep state S0
2) Power rail on when system puwer supply is up
3) Only available when system provides +12V via backplane
4) 6Gbps SATA (PC6-TANGO APL-I SoC)
5) 6Gbps SATA (PC6-TANGO optional Marvell SATA controller)

Note: All TX/RX designations with respect to SATA host controller (TX controller = RX drive, RX controller = TX drive)

Rear I/O Connector J2

As an option together with CompactPCI® and CompactPCI® PlusIO CPU carrier cards only, the PCU-UPTEMPO can be equipped with a rear I/O connector J2. A single slot rear I/O backplane (directly adjoining the CompactPCI® Classic backplane) would be required for handing over the available signal lines to a suitable rear I/O transition module.



Schroff/Pentair 23090-719

A suitable single slot rear I/O backplane must have no interconnections or copper planes such as power or ground between different pins, since this would cause a short circuit situation for the I/O signals affected. Sometimes a fitting single slot RIO backplane is referenced as P4/P5 backplane, since it was originally intended to be installed with 6U CompactPCI® Classic boards for J4/J5 rear I/O. EKF recommends the 'Schroff I/O board backplane order code 23090-719', or Elma/Trenew #80970-001 (both items EKF part no. 932.2.01.000).

A single slot P1/P2 RIO backplane does not fit into a system with a left hand CompactPCI® Serial backplane, with respect to the required 4HP slot distance, due to the different backplane connector dimensions of a Serial board. Hence, the PCU-UPTEMPO cannot be used for rear I/O together with CompactPCI® Serial CPU cards.

Please note, that quite a lot of signals are also available either on-board or via front panel (stuffing options). Be sure to have connected any signal only once, in order to avoid interference/malfunction or even damage. The PCU-UPTEMPO must not be plugged into a common CompactPCI® peripheral slot in order to avoid damaging the board or other components of the system. Signal names used in the J2 connector table hereafter are associated with their main function. However, the Super I/O controller allows a number of signals also be used as general purpose I/O. Please consult the SMSC SCH3114 datasheet for details (www.smsc.com).

Connector Assignment J2 Rear I/O

J2	A	B	C	D	E
22	+5V_S	+3.3V_S	+3.3V_A	+5V_A	+12V_A
21	GND	GND	GND	GND	GND
20	SP1_RI#	SP1_CTS#	SP2_RI#/GP50	SP2_CTS#/GP56	*NC*
19	SP1_RXD	GND	SP2_RXD/GP52	GND	*NC*
18	SP1_DSR#	SP1_DCD#	SP2_DSR#/GP54	SP2_DCD#/GP51	*NC*
17	SP1_DTR# 3)	GND	SP2_DTR#/GP57	GND	GND
16	SP1_RTS# 3)	SP1_TXD	SP2_RTS#/GP55 3)	SP2_TXD/GP53	DBRESET# (input)
15	RSVD	GND	*NC*	GND	RESET# (output)
14	SP3_RI#/GP13	SP3_CTS#/GP16	SP4_RI#/GP31	SP4_CTS#/GP62	SMB_DAT 1)
13	SP3_RXD/GP10	GND	SP4_RXD/GP64	GND	SMB_CLK 1)
12	SP3_DSR#/GP14	SP3_DCD#/GP12	SP4_DSR#/GP66	SP4_DCD#/GP63	GND
11	SP3_DTR#/GP15	GND	SP4_DTR#/GP34 2)	GND	*NC*
10	SP3_RTS#/GP17	SP3_TXD/GP11	SP4_RTS#/GP67 2)	SP4_TXD/GP65	*NC*
9	RSVD	GND	RSVD	GND	GND
8	LPT_SLCT	LPT_PE	LPT_BUSY	SIO_GP47	*NC*
7	LPT_ACK#	GND	GND	SIO_GP46	GND
6	LPT_D7	LPT_D6	LPT_D5	SIO_GP45	*NC*
5	LPT_D4	GND	LPT_D3	SIO_GP44	*NC*
4	LPT_D2	LPT_D1	LPT_SLCTIN#	SPEAKER	GND
3	LPT_D0	GND	LPT_INIT#	KBDAT	KBCLK
2	LPT_ALF#	LPT_ERROR#	LPT_STROBE#	GND	+5V_A
1	GND	GND	GND	MSDAT	MSCLK

1) Manufacturing option: SM Bus signals buffered via LTC4300A-3, voltage level @ +5V_CR buffer enable input is controlled by GP40 SCH3114 SIO (high=enabled)

2) GP34 may be used to control serial EEPROM A1 (stuffing option)
GP67 may be used to control serial EEPROM WP (stuffing option)

3) These serial port handshake signals may be also in use for power up strapping options of the SCH3114 SIO (10k PU or PD) with no or minor impact on normal operation

Additional Functions

SMBus EEPROM

The PCU-UPTEMPO is provided with a 24C02 2Kbit I^2C EEPROM, for storing board configuration data. The EEPROM is accessed via the SMBus.

If required, the SMBus EEPROM address A1 can be optionally controlled (stuffing option) by SIO GP34 (serial port 4 DTR#), and the SMBus EEPROM WP is likewise tied to GP67 (serial port 4 RTS4#).

Schematics

Complete circuit diagrams for this product are available for customers on request. Signing of a non-disclosure agreement would be needed. Please contact sales@ekf.de for details.

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